

REMARKS

Applicants gratefully acknowledge the courtesy of a personal interview granted to applicants Roby and Klassen, Applicant's representative James M. Heintz, and Michael Ramotowski by Examiner Rodriguez on November 23, 2005. At the interview, Applicants' representative expressed his belief that U.S. Patent No. 6,932,594 to Weclas was not a proper reference under 35 U.S.C. § 102(e) because the corresponding PCT application was published in the German language. Applicants' representative also expressed his belief that the provisional applications filed on October 10, 2002 and December 4, 2002, which are relied on for priority in the instant application and which pre-date the publication of German patent application no. 10127043.7. Applicants and their representative also explained, as more fully set forth below, that the Tenney patent (U.S. Patent No. 4,013,396) did not anticipate the currently pending claims because Tenney did not disclose combustion of a gas mixture but rather the combustion of a mixture of liquid droplets of fuel and air (referred to in Tenney as an aerosol). Finally, Applicants and their representative further explained that the Gerhold patent (U.S. Patent No. 6,779,333) did not anticipate the currently pending claims because Gerhold did not disclose premixing of a fuel gas with a second gas containing oxygen. In particular, applicants and their representative explained to the Examiner their belief that the "natural gas" supply 110 of Figure 2 of Gerhold is not a second gas containing oxygen as Gerhold discloses that the gaseous fuel supplied by the supply 110 is a "normally gaseous hydro-carbon containing fuel such as, for example, natural gas."

Claims 1-8, 12-33 and 37-41 are currently pending in the application.

Claims 1-5, 12-21, 23, 24, 27-30 and 37-40 stand rejected under 35 U.S.C. § 102 as being anticipated by Tenney. This rejection is respectfully traversed. The Office Action relies on Figure 8 of Tenney as support for the rejection. Tenney discloses a system in which a liquid fuel is vaporized and then aerolized prior to combustion. The vaporized liquid fuel is

condensed into an aerosol fuel in an aerosol area 222, which is shown as a series of dots in Fig. 8. Tenney, col. 7, lines 15-19. These dots are “relatively even-sized particles, the majority of particles having a diameter of less than one micron.” Col. 7, lines 19-21.

Because Tenney discloses that the vaporized fuel is condensed into particles in a aerosol area 222, and the aerosol area 222 is at the flame front, it is clear that Tenney does not disclose “combusting the gas mixture in the combustion zone” as required by independent Claims 1 and 23. Tenney also does not disclose a combustor configured to “combust the gas mixture in the combustion zone” as required by claim 27. Accordingly, withdrawal of the rejection of claims 1-5, 12-21, 23, 24, 27-30 and 37-40 based on Tenney is respectfully requested.

Claims 1-5, 12-24, 27-30 and 37-41 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Weclas. This rejection is respectfully traversed. As discussed above, Weclas is not a proper reference under 102(e) as the corresponding PCT application was published in German as WO 02/099334, and the corresponding U.S. application was not filed until December 23, 2003 – after the filing of the instant application. Accordingly, Applicants respectfully request withdrawal of all rejections based on Weclas.

Claims 1-5, 12-24, 27-30 and 37-41 stand rejected under 35 U.S.C. § 102(e) as being anticipated by German Patent Application No. 10127043.7 (the “German application”), to which the Weclas patent discussed in the previous paragraph claims priority. On the basis of the Weclas patent, applicants believe that June 2, 2001 was the filing date of the German Application, and Applicants are not aware of any publication of the German Application prior to the publication of the corresponding PCT Application on December 12, 2002. Accordingly, Applicants believe that both of the provisional patent applications relied upon for priority in the instant application (60/417,184 and 60/430,653) pre-date the German Application as well as the corresponding PCT Application WO 02/099334.

At the interview, the Examiner specifically requested that Applicants discuss support in the provisional applications for the premixing limitation of Claim 1. Applicants draw the Examiner's attention to page 1, lines 13-20, which discusses premixed combustion in which "natural gas is premixed with excess combustion air prior to arrival at the flame front." Applicants further note the passage at page 4, lines 1-5, which discusses producing a prevaporized fuel and burning the prevaporized fuel in a "lean, premixed flame." Applicants note that "premixed flame" is a term of art known well to those of skill in the art. This is reflected in the well known textbook by Stephen Turns, "An Introduction to Combustion," which states that "flames are categorized as being either premixed flames or nonpremixed (diffusion) flames." (Page 6). Turns further teaches that "[i]n a premixed flame, the fuel and the oxidizer are mixed at the molecular level prior to the occurrence of any significant chemical reaction" and "[c]ontrarily, in a diffusion flame, the reactants are initially separated, and reaction occurs only at the interface between the fuel and oxidizer, where mixing and reaction both take place." Accordingly, the pre-mixing step of Claim 1 is fully supported in the originally filed specification.

Attached hereto is a claim chart for each of the independent claims and several of the dependent claims showing where each element of those claim are supported in the specification. Applicants note that several other dependent claims (Claims 4, 12, 17-20, 29, 38, and 40) are rejected as anticipated by the German Application but no specific citation of the German Application was supplied in the Office Action. For example, Claim 17 recites "butane," but Applicants are unable to locate any reference to "diesel fuel" in the Weclas patent (which may or may not include subject matter identical to that of the German Application) and are unable to determine whether the German Application discloses butane because they do not have a translation of the German Applicant. Accordingly, Applicants respectfully request withdrawal of all rejections of the dependent claims based on the German

Application or the specific identification of disclosure in the German Application for each of the currently pending dependent claims.

Claims 1-6, 14-23, 27-31, and 38-41 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Gerhold. This rejection is respectfully traversed. Claim 1 requires the mixing of a vaporized fuel/reduced oxygen gas mixture with a “second gas including oxygen.”

Claim 23 requires the premixing of a “reduced oxygen fuel gas and a second gas to produce a gas mixture . . . having an amount of oxygen sufficient to support combustion of the gas mixture.” Claim 27 requires the mixing of “the vaporized fuel with an oxygenated gas.” Nothing in Gerhold teaches or suggests this feature.

As discussed above, the Office Action relies on the natural gas source 110 of Figure 2 for the teaching of a second, oxygen-containing gas that is mixed with a vaporized fuel gas. However, the natural gas source 110 is described in Tenney at col. 4 line 27-28 as “preferably a natural gas pipeline” and at col. 4, lines 39-41 as supplying “any normally gaseous hydrocarbon-containing fuel.” Applicants respectfully submit that one of skill in the art would not understand natural gas pipelines and normally gaseous hydrocarbon-containing fuels as containing oxygen.

Moreover, nothing in Gerhold describes any premixing of a vaporized fuel gas with an oxygen-containing gas or any auto-ignition problem associated therewith. Indeed, Gerhold is apparently directed toward a diffusion flame rather than a pre-mixed flame. Gerhold’s preferred embodiment has a flame temperature of 3950°F. This temperature, as shown in Figure A-3 on page 19 of the Davis reference attached to the Information Disclosure Statement submitted on even date herewith, is near or at the maximum flame temperature and is indicative of a flame with an equivalence ratio of 1. Diffusion flames, by their nature, combust with an equivalence ratio of 1 (note that an equivalence ratio of 1 also means that the combustion is occurring in a stoichiometric reaction). In contrast, pre-mixed

flames are typically (but not necessarily) burned in the lean mode with an equivalence ratio less than 1 and are therefore typically well below the maximum temperature. Moreover, the fact that Gerhold discloses other temperature ranges below the maximum temperature is apparently indicative of the use of steam to lower the flame temperature as discussed in the Brown reference (note discussion of diluents to lower flame temperature at column 1 of page 19) and not of any pre-mixing. Therefore, Gerhold appears to be directed to a diffusion burner and does not disclose pre-mixing, which is required by all of the claims rejected over Gerhold. Accordingly, withdrawal of the rejection of all claims based on Gerhold is respectfully requested.

In light of the foregoing, this application is now believed to be in condition for immediate allowance. The claims present patentable subject matter, and the Examiner is kindly requested to pass this application to issue. Should the Examiner wish to discuss this case or have any suggestions to place it into even better condition for allowance, he is kindly invited to contact the Applicants' below-signed representative by telephone at the number provided below.

Respectfully submitted,

DLA PIPER RUDNICK GRAY CARY US LLP

A handwritten signature in black ink, appearing to read 'James M. Heintz', is written over a horizontal line.

James M. Heintz
Registration No. 41,828

1200 Nineteenth Street, N.W.
Washington, D.C. 20036-2412
Telephone No. (202) 861-3900
Facsimile No. (202) 223-2085



CLAIM	
1. (Original) A method for operating a combustion device, the method comprising the steps of:	
producing a fuel gas using a liquid fuel comprising hydrocarbon molecules and a first gas stream with an oxygen content less than that of ambient air;	Page 3, lines 8-11, page 5, lines 14-17
premixing the fuel gas and a second gas to produce a gas mixture at a location upstream of a combustion zone of a combustion device the second gas including oxygen; and	Page 4, lines 4-5; see also page 1, lines 13-18
combusting the gas mixture in the combustion zone of the combustion device, whereby auto-ignition of the gas mixture upstream of the combustion zone is substantially suppressed.	Page 3, line 18 - page 4 line
2. (Original) The method of Claim 1, wherein the gas mixture has an amount of oxygen sufficient to support combustion of the gas mixture.	Page 1, lines 16-18
3. (Original) The method of Claim 1, wherein the gas mixture is a lean mixture with an equivalence ratio less than 1.	Page 4, lines 4-5 (see also page 1, lines 13-20)
5. (Original) The method of Claim 1, wherein the oxygen content of the first gas stream is below a limiting oxygen index of the liquid fuel.	Page 4, lines 17-22
6. (Original) The method of Claim 1, wherein the combustion device includes a fuel metering system configured for natural gas.	Page 5, lines 18-21
7. (Original) The method of Claim 1, wherein the first gas stream is supplied by an air separator.	Page 4, lines 8-15
8. (Original) The method of Claim 7, wherein the air separator produces the first gas stream using adsorption.	Page 4, lines 15-16
13. (Original) The method of Claim 1, wherein the reduced oxygen gas stream is supplied from an exhaust of the combustion device.	Page 3, lines 16-18

15. (Original) The method of Claim 1, wherein the liquid fuel is diesel fuel.	Page 5, line 15
16. (Original) The method of Claim 1, wherein the liquid fuel is heating oil.	Page 5, lines 15-16
21. (Original) The method of Claim 1, wherein the liquid fuel is a flammable liquid waste.	Page 5, line 16
22. (Original) The method of Claim 1, wherein the combustion device is a gas turbine engine.	Figure 3; page 6, lines 8-10
23. (Original) A method for operating a combustion device configured to combust natural gas in a lean, premixed mode, the method comprising the steps of:	
vaporizing a higher hydrocarbon liquid fuel using a gas stream having a reduced oxygen content relative to ambient air to produce a reduced oxygen fuel gas;	Page 3, lines 8-11; page 5, lines 14-17
premixing the reduced oxygen fuel gas and a second gas to produce a gas mixture at a location upstream of a combustion zone of a combustion device, the gas mixture having an amount of oxygen sufficient to support combustion of the gas mixture, the gas mixture having an equivalence ratio less than one, the combustion device being configured to combust natural gas; and	Page 4, lines 4-5 (see also page 1, lines 13-18)
combusting the gas mixture in the combustion zone of the combustion device, whereby auto-ignition of the gas mixture upstream of the combustion zone is substantially suppressed.	Page 3, line 18 – page 4, line 1
24. (Original) The method of Claim 23, wherein the gas stream is derived from an exhaust gas stream of the combustion device.	Page 3, lines 16-18

25. (Original) The method of Claim 23, wherein the gas stream is provided by an air separator unit.	Page 4, lines 8-15
26. (Original) The method of Claim 23, wherein an oxygen rich gas stream from the air separator unit is input to the combustion device.	Page 5, lines 11-13
27. (Currently Amended) A combustion system comprising:	
a combustion device, the combustor having an inlet for accepting a vaporized fuel, a combustion zone, and a premixing zone upstream of the combustion zone, the combustion device being configured to mix the vaporized fuel with an oxygenated gas stream in the premixing zone to produced a <u>gas mixture suitable for combustion and combust the gas mixture</u> in the combustion zone; and	Page 4, lines 4-5 (see also page1, lines 13-18) Page 4, line 17 – page 5, line 1
a fuel vaporization unit connected to the inlet of the combustion device, the fuel vaporization unit being configured to supply a reduced oxygen vaporized fuel gas stream to the combustion device via the inlet, the fuel vaporization unit including a fuel vaporizer with a first inlet connectable to a liquid fuel source and a second inlet connectable to a reduced oxygen gas stream.	Fig. 1, reference numeral 1, page 6, line 21 – page 7, line 9
28. (Original) The system of Claim 27, wherein the combustion device is configured combust the reduced oxygen vaporized fuel gas at an equivalence ratio less than 1.	Page 4, lines 4-5 (see also page 1, lines 13-18)
30. (Original) The system of Claim 27, wherein the oxygen content of the reduced oxygen gas stream is below a limiting oxygen index of the liquid fuel.	Page 4, lines 17-22
31. (Original) The system of Claim 27, wherein the combustion device includes a fuel metering system configured for natural gas.	Page 5, lines 18-21

32. (Original) The system of Claim 27, wherein the fuel vaporization unit further comprising an air separation unit configured to produce a reduced oxygen stream at a first outlet, the first outlet being connected to the second inlet of the fuel vaporizer.	Page 4, lines 8-15
33. (Original) The system of Claim 32, wherein the air separator produces the reduced oxygen stream by adsorption.	Page 4, lines 15-16
37. (Original) The system of Claim 27, wherein the reduced oxygen gas stream is supplied from an exhaust gas stream output by the combustion device.	Page 3, lines 16-18
39. (Original) The system of Claim 27, wherein the liquid fuel is a liquified gas, the liquified gas being of a composition that would be in a gaseous state at room temperature under atmospheric pressure.	Page 5, lines 14-15